BOOK REVIEWS

Physics of Hot Plasma

Eds B. J. Rye & J. C. Taylor O. P. P. 455 XIV.
Oliver & Boyd. Edinburg, 1970. Price £ 8.

This book contains the lectures delivered at the 9th 'Scottish Universities' Summer School held at Newbattle Abbey from 28th July to 16th August 1968 and was sponsored jointly by Scotish Universities and NATO This is a collection of lectures delivered on different aspects of plasma by eminent people in the line, however, topics are arranged in proper sequence, such that the subject is developed most logically. According to present reviewer the following topics are remarkably well covered (a) Kinetic theory of plasma (b) Waves and oscillations (c) Collisionless shocks, d) Collisionless shock waves. This is a welcome edition. This book can be treated as an advanced text and will be useful to research workers and students alike. At a first glance one may think this is a collection of theoretical lectures but actually excellent attempts have been made to demonstrate how theory and experiments are linked up in hot plasma. Kinetic theory of plasma was discussed at length by Prof. W. B. Thomson & C. Oberman; the theory of waves and oscillations by Prof. R. J. Taylor and plasma instabilities by E. G. Harris. The importance of computational problems and numerical methods in plasma physics and controlled thermonuclear research was demonstrated by Prof. J. Killen. Turbulence was discussed by Prof M. G. Rustridge. The topics which are of current interest 'Collisionless shock' and 'Collisionless shock waves' were discussed by Prof. H. Volk and Prof. J. W. M Paul. These topics will surely receive more attention (both theoretically and experimentally) in near future. The theoretical and experimental aspects of production of plasma by focussed laser beam were discussed by Prof. S. A. Ramsden. Experiments on the production and confinement of hot plasma was covered by Prof. G. B. F. Niblet while optical diagnostic was given by Prof U. Ascoli Bartoli. Each topic is followed by an excellent uptodate bibliography.

B. C.

Correlation Effects in Atoms and Molecules

Advances in Chemical Physics, Vol. XIV,
Edited by R Lefebvre and C. Moser.
Interscience Publishers, 1969, 545 pages

Recently the field theoretic methods are being extensively applied to atoms, molecules and many areas of solid state physics. Calculation of accurate wave functions of many-electron atoms and polyatomic molecules poses formidable computational problems. Hartree-Fock and other self-consistent methods are not suitable to deal with problems such as correlation and co-operative phenomena which are distinctly "many body effects".

The volume under review is a collection of papers which present field theoretic methods used in the calculations of correlation effects in atoms and molecules. Of the 13 papers included in this volume, 8 deal exclusively with atoms and among the rest one is on the electron gas. With the exception of two papers, all deal with the extensions of "traditional"methods such as Hartree-Fock methods and Bethe-Goldstone diagram technique of the many body theory.The exceptions are by B. R. Judd who makes extensive use of group theory and by

V. V. Tolmachev who makes use of angular momentum diagrams which are quite interesting. The Editors hope that this book will encourage the younger generation to work in this most promising yet notoriously difficult and challenging area of physics. In the opinion of the reviewer, this is a very valuable book for those who are carrying out active research work in this field but those who want to have a bird's eye view of the situation will find it difficult to follow most of the book.

A. S. C.

Cosmic Electrodynamics

Piddington—*John Willey & Sons.* pages 305.

This book is a valuable addition to the subject which has appeal to both physicists and astrophysicists. After giving a brief historical highlight of the subject, the author proceeds further to present elaborately the various aspects of cosmic electrodynamics, namely cosmic plasmas, sun and solar activity, interplanetary medium, earth's magnetosphere, geomagnetic disturbances, radio galaxies, ionospheric currents and other related phenomena. In the first four chapters the basic principles are discussed. The rest of the chapters are devoted to solar system and other interesting phenomena of geophysics In many contexts the observational results are described and are explained as far as possible with the existing theories. The chapters on galactic forms and radio galaxies are quite good.

On the whole, this book provides an excellent overview of the current status of many aspects of cosmic electrodynamics. This book will not only be of interest to specialist in the field but will be a very useful monograph for both students and research worker as a text and reference copy.

R. D.

Elementary Calculations in Biochemistry and Physiology

J. A. Barclay and K. White, *Churchill, London* (1969)–88+viii pages–20sh

This book, according to the authors, is intended to help "the medical students in preclinical years, the students of human biology in colleges of education and all new students of biochemistry and physiology who find that numerical calculation seems to hinder rather than help the approach to these subjects". Of its 12 chapters, four are devoted to topics of general or mathematical utility—S.I. units, numerical accuracy, errors of observation and calibration curves. These should prove very helpful to students just entering college for courses in chemistry or physiology whose mathematical background is deficient. Five chapters describe elementary calculations concerned with measures of composition, the *p*H scale, equilibrium constants, electrode measurements and osmotic phenomena. They provide a useful introduction to basic concepts, though the theoretical treatment is at too elementary a level to be of value to students taking degree courses in chemistry in preparation for specialization at the M.Sc. level. In particular, the chapter on electrode measurements appears to be too superficial on the theoretical side. It would have been helpful to have discussed the physical basis and applications of the Nernst equation more fully.

Two chapters on respiration, circulation and work and electrolyte and water balance deal with calculations of interest in physiology. The purpose of the last chapter 'non-calculations' is intriguing : it merely illustrates problems which are insoluble because an essential datum is not available, or are not susceptible to numerical treatment.

The book should be of value chiefly as a preliminary aid to exorcising the fear of even simple mathematical treatment, found so often among students of biology. The style of writing is calculated to hold the interest of the student. There are few misprints—but we may draw attention to the following —p 6, millicron for millimicron in the table of small dimensional units; omission of the equation no.—(6)—from the equation on p. 37; 'relaced' for 'replaced' on p 78, l.16. The price of 20sh may discourage wide use of the book by those for whom it is meant.

A. N.

Electrodynamics of Particles and Plasmas

By Clemmow and Daugherty, *Addison Wesley Publishing Co.* (1969) 457 pages.

The subject, dealt with in the present book though of recent origin, has developed so much during the past four decades that it indeed appears a difficult task to compress it entirely into a single book. However, Clemmow and Dougherty, who have themselves contributed so significantly to the development of the subject, have done a great service to the readers by writing this book. It will be found useful equally by those who wish to learn the subject and by those who wish to use it as a reference book. The authors have clearly set all the physical principles and given the physical explanations of all the results which they discuss in the book They have given important references at the end of each chapter, specially those which they refer in the text. They have also given some examples at the end of each chapter so that the reader may check for himself if he has understood what he has learnt in the chapter. This entitles the book to be treated as a text book.

The reviewer has great pleasure in recommending this book to the research workers on this fascinating subject, which has been dealt in the book using both the particle and the continuum descriptions. To some readers the book will look incomplete as far as the discussion of instability and the correlations is concerned but the authors have indicated the texts to which a reader can refer in the case of the first topic and it is difficult to expect them to include all the literature in development in the case of the second topic.

The book contains the following twelve chapters covering about 450 pages :

1) Introduction,
2) Electro-dynamics
3) Cerenkov and Gyro Radiation
4) Dynamical Motion of a Point Charge
5) Waves in an Ionized Gas : Magneto-Ionic Theory
6) Plasma Streams
7) Boltzmann's Equation,
8) Waves in Ionized Gases : Kinetic Theory
9) Waves in Ionized Gases : Kinetic Theory (continued)
10) Micro Instabilities
11) The Derivation of Magnetohydrodynamics
12) Kinetic Equations in Plasmas

In the opinion of the reviewer it is an excellent addition to the library on the subject and the authors deserve hearty congratulations on producing such an useful book.

P. L. B.